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BAKER (MICHAEL) JR INC BEAVER PA  
NATIONAL DAM SAFETY PROGRAM. SALISBURY LAKE DAM (INVENTORY NUMB--ETC(U)  
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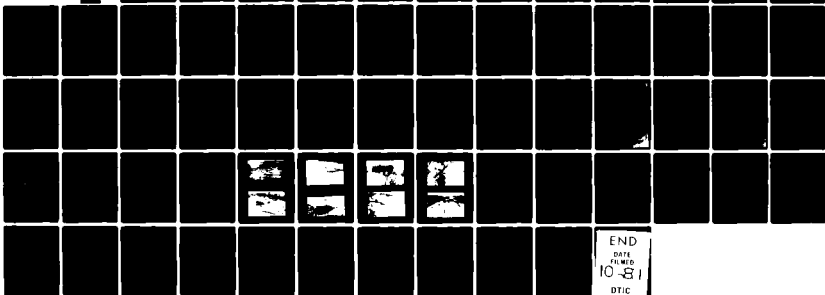
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Salisbury Lake Dam (Inventory Number  
VA-04136) James River Basin. Chester  
County, Commonwealth of Virginia.  
Phase I Inspection Report.

Feb 81

DACW65-80-D-0032

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## 20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Inspection is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspection. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

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## PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the design flood should not be interpreted as necessarily posing a highly inadequate condition. The design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM

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NAME OF DAM: SALISBURY LAKE DAM

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Salisbury Lake Dam  
State: Commonwealth of Virginia  
County: Chesterfield  
USGS 7.5 Minute Quadrangle: Midlothian, VA  
Stream: Falling Creek  
Date of Inspection: 10 November 1980

BRIEF ASSESSMENT OF DAM

Salisbury Lake Dam is an earthfill embankment with a compacted clay core, approximately 1020 feet long and 37.3 feet high<sup>1</sup>. The Dam is situated on Falling Creek, approximately 1.0 miles north of Midlothian, Virginia, and is used for recreational purposes by the owner, the Salisbury Lake Property Owners Association. Salisbury Lake Dam is a "small" size - "high" hazard structure as defined by the Recommended Guidelines for Safety Inspection of Dams. Deficiencies found during the field inspection and office analyses will require remedial treatment. A stability check is not required.

The principal spillway consists of a 4 foot by 4 foot concrete riser, a 24 inch diameter corrugated metal pipe through the embankment and a concrete-lined discharge channel. The emergency spillway is a concrete-lined trapezoidal channel running from the control section at the right<sup>2</sup> side of the embankment to a stilling basin below the dam. A 24 inch diameter emergency gate, located on the upstream face of the riser, allows the reservoir level to be lowered approximately 7 feet.

Using the Corps of Engineers' screening criteria for initial review of spillway adequacy, the PMF was selected as the SDF for the "small" size - "high" hazard classification of Salisbury Lake Dam. The dam would be overtopped by the SDF, and the depth, duration, and rate of overtopping flows are considered detrimental to the embankment. The spillways are capable of passing only 30 percent of the PMF.

The spillway is adjudged as seriously inadequate, since dam failure from overtopping would significantly increase the hazard to loss of life downstream from the dam over that which would exist just before overtopping failure.

<sup>1</sup>Measured from the invert of the stilling basin at the end of the emergency spillway discharge channel to the minimum embankment crest.

<sup>2</sup>Facing downstream.

NAME OF DAM: SALISBURY LAKE DAM

The dam and appurtenant structures were found to be in generally fair condition at the time of the inspection. There is no riprap protection on the upstream embankment and wave action has created a vertical scarp at the waterline. The remainder of the upstream embankment is moderately eroded and sparsely vegetated. Due to the lack of adequate vegetative cover, erosion is occurring in scattered areas along the crest, the downstream embankment, and the spillway discharge channels. A minor seep was observed below the outlet of the toe drain and two adjacent seeps were observed along the lower section of the spillway discharge channel. Some debris has collected around the base of the primary spillway intake structure and the emergency gate is in poor condition. The dam is assessed as unsafe, non-emergency.

There is currently no warning system or emergency action plan in operation.

It is recommended that, within two months of the date of notification of the Governor of the Commonwealth of Virginia, the owner engage the services of a professional engineering consultant to determine by more sophisticated methods and procedures the adequacy of the spillways. The study should include a more detailed study of the downstream floodplain and of the spillway design flood appropriate to this dam. Remedial measures to be considered include modifications of the dam, spillway, floodplain, and/or any other method of eliminating the danger imposed by the project.

Within six months of the notification of the Governor, the consultant's report of appropriate remedial mitigating measures should have been completed and the owner should have an agreement with the Commonwealth of Virginia for a reasonable time frame in which all remedial measures will be complete.

Until corrective measures are completed, the dam should be checked during periods of heavy runoff. The seeps near the outlet of the toe drain and in the lower portion of the spillway discharge channel should be periodically checked and recorded. Monitoring of the flow rate and turbidity is recommended. If turbidity or increased flow is noted, a qualified geotechnical engineering firm should be retained to perform a stability check of the dam. If evidence of piping of embankment material is found or if dam overtopping is imminent, warning should be issued to the downstream inhabitants.

NAME OF DAM: SALISBURY LAKE DAM



In the interim, an emergency action plan and warning system should be promptly developed. It is recommended that a formal emergency procedure be prepared, prominently displayed, and furnished to all operating personnel. This should include:

- 1) How to operate the dam during an emergency.
- 2) Whom to notify, including public officials, in case evacuation from the downstream area is necessary.
- 3) Procedures to evaluate inflow during periods of emergency operation.

Regular inspections should be made of the dam and appurtenant structures. A thorough checklist should be compiled for use by the owner's representative as a guide for the inspections. Maintenance items should be completed annually.


The following items can be accomplished as part of the general maintenance of the dam:

- 1) Place riprap on the upstream embankment, extending into the water and above the principal spillway inlet elevation. Fill, compact, reseed, and mulch the remaining portion of the upstream embankment.
- 2) Mulch and reseed the crest of the dam and sparsely vegetated areas on the downstream embankment.
- 3) Fill, compact, seed, and mulch the low area to the left of the left abutment.
- 4) Fill, compact, and riprap the two foot deep gully along the junction of the downstream embankment with the left abutment.
- 5) Fill, compact, reseed, and mulch the eroded areas adjacent to the discharge channels of both the principal and emergency spillways.
- 6) Install a trash rack on the intake structure of the principal spillway.
- 7) Install a staff gage to monitor reservoir levels above normal pool.

The owner of the dam has been in contact with the engineer of record for this dam and has indicated that a mutually agreeable plan will be devised to remedy deficiencies noted in this report.

NAME OF DAM: SALISBURY LAKE DAM

MICHAEL BAKER, JR., INC.

  
Michael Baker, III, P.E.  
Chairman of the Board and  
Chief Executive Officer



SUBMITTED:

*ORIGINAL SIGNED BY*  
*James A. Walsh*  
James A. Walsh, P.E.  
Chief, Design Branch

RECOMMENDED:

*ORIGINAL SIGNED BY*  
*Jack G. Starr*  
Jack G. Starr, P.E.  
Chief, Engineering

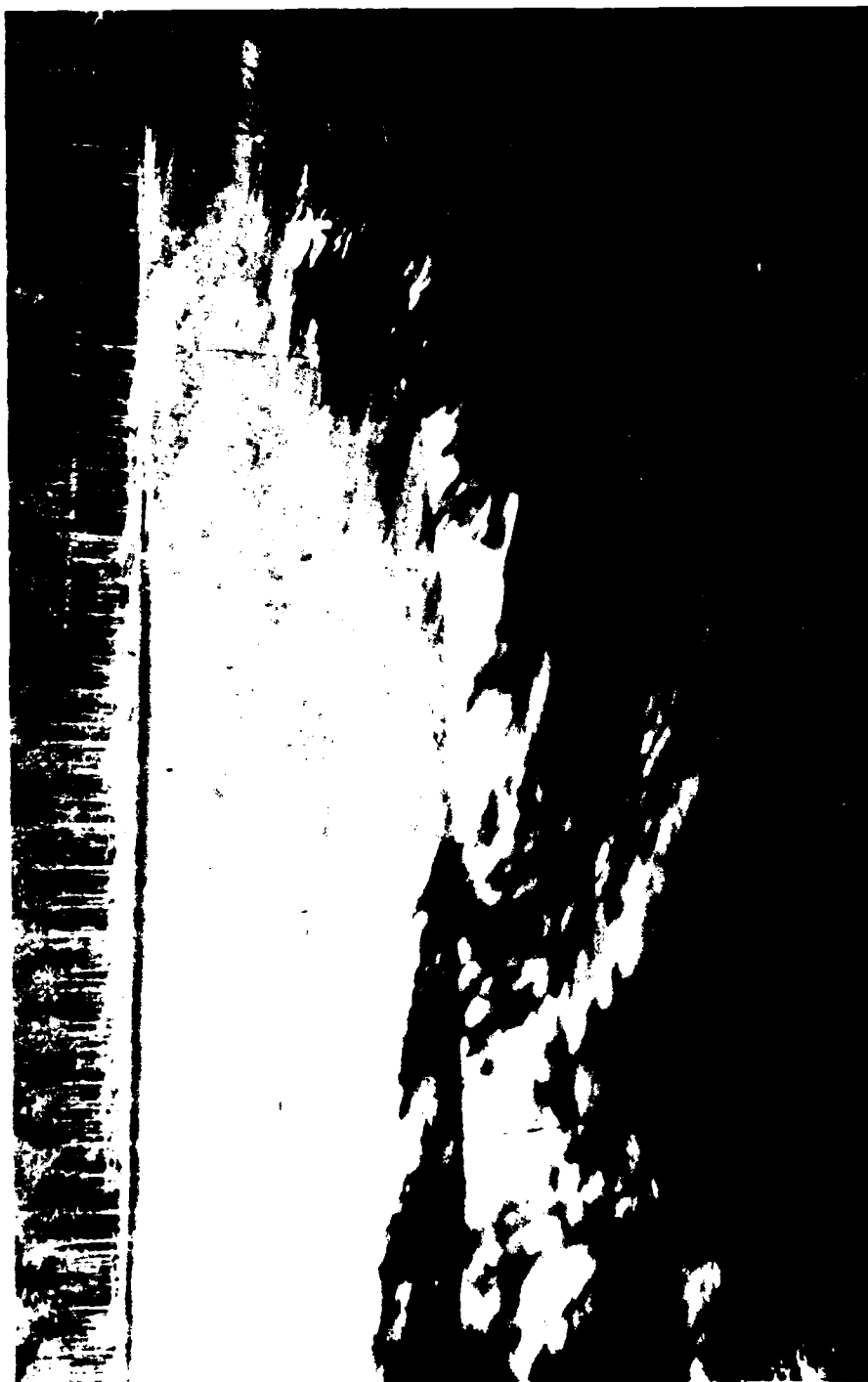
APPROVED:

Original signed by:  
Douglas L. Haller  
Douglas L. Haller  
Colonel, Corps of Engineers  
District Engineer

Date:

MAR 11 1981

NAME OF DAM: SALISBURY LAKE DAM



OVERALL VIEW OF DAM

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM  
NAME OF DAM: SALISBURY LAKE DAM ID# VA 04136

SECTION 1 - PROJECT INFORMATION

1.1 General

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of safety inspections of dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams (Reference 12, Appendix IV). The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Description of Project

1.2.1 Description of Dam and Appurtenances: Salisbury Lake Dam is an earthfill embankment with a compacted clay core. The dam is approximately 1020 feet long and 37.3 feet high<sup>1</sup>, with an average crest width of about 15.5 feet. The upstream and downstream slopes are 2.5H:1V and 3.4H:1V (Horizontal to Vertical) respectively. Design elevation of the crest is 311.0 feet T.B.M.<sup>2</sup> The minimum top of dam, as determined from the field investigation, is elevation 310.3 feet T.B.M.

According to the design plans, the dam has a compacted clay core running the entire length of the embankment. The top of the clay core

<sup>1</sup>Measured from the invert of the stilling basin at the end of the emergency spillway discharge channel to the minimum embankment crest.

<sup>2</sup>All elevations are referenced to the emergency spillway crest elevation. Design elevation of this point is 305.5 feet T.B.M.

NAME OF DAM: SALISBURY LAKE DAM

is approximately 5 feet wide and 2 feet below the crest of the dam. The base of the clay core, on the existing ground line before construction, is approximately 75 feet wide and 35 feet below the top of the core. A trapezoidal-shaped key and cutoff trench of compacted clay extends below the core to solid rock or an adequate layer of impervious material, a maximum depth of 20 feet. Material used on the outer surface of the embankment was not specified on the design plans. A toe drain has been installed to handle internal drainage of the dam (Photos 4 and 5).

There is no slope protection on either the upstream or downstream embankments or on the crest of the dam.

The principal spillway intake structure is a 4 foot by 4 foot concrete drop inlet located approximately 770 feet from the left<sup>3</sup> abutment and 20 feet offshore (Photo 1). The crest elevation is 305.0 feet T.B.M. Water entering the principal spillway is drained through the embankment by a 24 inch corrugated metal pipe (C.M.P.) This pipe is 120 feet long and the invert elevations at the bottom of the tower and the outlet are 298.0 feet T.B.M. and 295.1 feet T.B.M., respectively. A 24 inch emergency gate on the upstream face of the intake structure permits lowering of the reservoir to an elevation of approximately 298.3 feet T.B.M. Below the principal spillway outlet structure is a trapezoidal-shaped, concrete channel 35.0 feet long, with a bottom width of 2.0 feet, 1.75H:1V side slopes and a depth of 2.2 feet (Photo 2). This channel carries the flows to the discharge channel of the emergency spillway, approximately 250 feet from the stilling basin at the end of the emergency spillway discharge channel.

A concrete-paved, trapezoidal-shaped emergency spillway is located at the right end of the dam. The control section has a bottom width of 40.0 feet, 1.75H:1V side slopes extending

<sup>3</sup>Facing downstream.

NAME OF DAM: SALISBURY LAKE DAM

to the crest of the dam, a height of about 5.5 feet, and a length of 14 feet. The crest elevation of the control section is 305.5 feet T.B.M. The discharge channel is a concrete-paved, trapezoidal channel extending from the control section to the stilling basin near the toe of the dam. Approximately 180 feet downstream of the control section, the principal spillway discharge channel empties into this channel. From the control section to the junction with the principal spillway discharge channel, the bottom width and depth of the emergency spillway discharge channel decrease to 8 feet and 2.2 feet, respectively. From the junction, the channel remains uniform to the stilling basin, approximately 250 feet downstream (Photo 3). The total length of the emergency spillway discharge channel, from the control section to the stilling basin, is approximately 430 feet and the total vertical drop is 30.6 feet.

The stilling basin is a rectangular-shaped depression, approximately 60 feet long and 30 feet wide, protected by dumped riprap. Rough concrete has been placed adjacent to the emergency spillway discharge channel at its lower end and along the side of the stilling basin nearest the dam.

- 1.2.2      Location: Salisbury Lake Dam is located on Falling Creek, approximately 1.5 miles upstream of the U.S. Route 1 bridge over Falling Creek and 1.0 miles north of Midlothian in Chesterfield County, Virginia. A Location Plan is included in Appendix I of this report.
- 1.2.3      Size Classification: The height of the dam is 37.3 feet and the reservoir storage capacity at the crest of the dam (elevation 311.0 feet T.B.M.) is 990 acre-feet. Therefore, the dam is in the "small" size category as defined by the Recommended Guidelines for Safety Inspection of Dams.
- 1.2.4      Hazard Classification: A large railroad embankment is located approximately 0.5 miles downstream of the dam. Falling Creek is conveyed beneath this embankment by a large rectangular culvert. Downstream from this

NAME OF DAM: SALISBURY LAKE DAM

culvert, approximately 20 homes are located low in the valley along the next 0.5 miles of Falling Creek. In the event of a dam failure, loss of life in this area would be probable and economic loss in the form of damage to the railroad embankment and to the homes downstream of the embankment would be severe. Salisbury Lake Dam is therefore considered to be in the "high" hazard category as defined by the Recommended Guidelines for Safety Inspection of Dams. The hazard classification used to categorize dams is a function of location only and is not related to the stability or probability of failure of the dam.

1.2.5 Ownership: The dam is owned by the Salisbury Lake Property Owners Association. The current president of the Association is Mr. Reed Schwkert, 2141 Oaken Gate Lane, Midlothian, Virginia, 23113.

1.2.6 Purpose of Dam: The dam is used to impound water for recreational purposes.

1.2.7 Design and Construction History: The dam was designed by J.K. Timmons and Associates, Civil Engineers, 711 North Courthouse Road, Richmond, Virginia. Construction of the dam was completed in 1973 by Shoosmith Brothers Construction Company. Repairs to areas adjacent to the spillway discharge channel were designed by J.K. Timmons and Associates and completed in 1980.

1.2.8 Normal Operational Procedures: The reservoir is normally maintained at the crest of the principal spillway, elevation 305.0 feet T.B.M. No formal operating procedures are followed for this structure. A detailed discussion of the manually operated outlet works is presented in paragraphs 4.1 and 4.3.

### 1.3 Pertinent Data

1.3.1 Drainage Area: The drainage area tributary to the dam is 1.4 square miles.

1.3.2 Discharge at Dam Site: The maximum discharge from the reservoir is unknown.

NAME OF DAM: SALISBURY LAKE DAM

Emergency Spillway

Pool elevation at top of dam . . 1564 c.f.s.

- 1.3.3 Dam and Reservoir Data: Pertinent data on the dam and reservoir are shown in the following table:

TABLE 1.1 DAM AND RESERVOIR DATA

Item	Elevation (feet T.B.M.)	Area (acres)	Reservoir Capacity		Length (miles)
			Acre- feet	Watershed (inches)	
Minimum top of dam	310.3	96.3	990	13.2	0.6
Emer. spillway crest	305.5	80.3	674	9.0	0.6
Principal spillway crest (normal pool)	305.0	38.3	645	8.6	0.6
Invert of stilling basin	273.0	-	-	-	-

NAME OF DAM: SALISBURY LAKE DAM



## SECTION 2 - ENGINEERING DATA

- 2.1 Design: An incomplete set of design drawings for the dam and spillways, dated 7 February 1968, and a design plan of repairs to be made adjacent to the spillway outlet channel, dated 9 April 1980, were obtained from the office of J.K. Timmons and Associates of Richmond, Virginia (Plates 2 through 4). No design calculations or stability analyses were available for review.
- 2.2 Construction: Construction of the dam and appurtenant structures was completed in 1973 by Shoosmith Brothers Construction Company. Repair work adjacent to the spillway discharge channel was completed at the time of the inspection, but neither the construction firm which performed the repairs nor the date of completion was obtained. Construction records, as-built plans, and inspection logs for the construction of the dam or subsequent repairs were not available for review.
- 2.3 Evaluation: No construction records, as-built plans, or stability analyses were available to adequately assess the condition of the dam. All evaluations and assessments in this report were based on available design information outlined in paragraph 2.1, field observations, discussions with the owner, and office analyses.

NAME OF DAM: SALISBURY LAKE DAM

## SECTION 3 - VISUAL INSPECTION

### 3.1 Findings

3.1.1 General: The field inspection was conducted on 10 November 1980. The weather was sunny and the temperature was 55 degrees Fahrenheit. At the time of the inspection, the pool elevation was 305.2 feet T.B.M. and the tailwater elevation was 274.9 feet T.B.M. The ground surface at the embankment and abutments was generally dry. The dam and appurtenant structures were found to be in fair overall condition at the time of the inspection. A Field Sketch of the conditions is provided as Plate 1 in Appendix I. The complete visual check list is provided in Appendix III. No records of previous inspections were available.

3.1.2 Dam: No surface cracks or unusual movement at or beyond the toe were observed. The upstream embankment is moderately eroded and sparsely vegetated with high grass (Photo 6). Wave action is resulting in the formation of a vertical scarp in the embankment, about 1 foot high, at the waterline. Riprap was not provided on the upstream embankment for protection from erosion. The downstream embankment is slightly to moderately eroded. It is generally better vegetated than the upstream embankment. The upper third of the downstream embankment is not well vegetated and is moderately eroded. The crest of the dam is unvegetated and unprotected.

The vertical and horizontal alignments of the crest are generally satisfactory, although a slight depression to the left of the left abutment has been caused by recent grading. This depression is approximately 70 feet wide and 0.7 feet lower than the design elevation of the crest.

A two foot deep gully has formed along the lower half of the junction of the downstream embankment with the left abutment (Photo 7). A less significant gully has also formed in the narrow area between the paved principal

NAME OF DAM: SALISBURY LAKE DAM

spillway discharge channel and the downstream embankment. This area is sparsely vegetated and erosion is affecting the toe area of the dam locally.

Very slight seepage was observed directly below the outlets of the two 6 inch toe drains (Photo 5). No drainage was occurring directly from the outlets. Animal guards were installed over the outlets. The outlets are situated unusually high on the embankment. Two adjacent seeps, with a combined flow of approximately 3 to 5 gallons per minute (g.p.m.) were observed emerging from the rough concrete adjacent to and discharging into the spillway discharge channel approximately 50 feet upstream of the stilling basin (Photo 8).

- 3.1.3      Appurtenant Structures: The intake structure of the principal spillway is a 4 foot by 4 foot concrete drop inlet tower (Photo 1) which is drained through the embankment by a 24 inch C.M.P. Some trash has collected at the bottom of the drop inlet. The outlet structure consists of a 24 inch C.M.P. embedded in a concrete headwall and is in good condition. No cracking or spalling of concrete surfaces in the outlet conduit was observed. The emergency gate is a 24 inch hand-operated gate which is in poor condition.

The approach channel of the emergency spillway is in generally good condition. Some sediment has been deposited in the approach channel as the result of minor erosion on the right abutment of the dam. The concrete in the control section is in good condition. Some erosion and minor sloughing is apparent on the natural slopes to the right of the emergency spillway discharge channel. Several small eroded areas have recently been back-filled and riprapped and are now in good condition.

- 3.1.4      Reservoir Area: The slopes around the reservoir are gentle and largely wooded. Homes border the reservoir. No significant signs of sedimentation or erosion were observed. A beach area has been developed on the slope of the lake near the left abutment of the dam.

NAME OF DAM:    SALISBURY LAKE DAM

A diving platform is anchored in the reservoir a short distance offshore. Near the right abutment, a picnic pavilion is located on the hillside above the reservoir.

3.1.5 Downstream Channel: A parking area is located on the hillside above the downstream side of the left abutment. A dirt road runs along the downstream toe of the embankment from the parking area to the stilling basin. A 14 inch storm sewer carries surface runoff from the parking area to the creek downstream of the stilling basin. Downstream of the stilling basin, the channel is heavily wooded. The stream channel below the dam has a slope of approximately 0.9 percent.

3.1.6 Instrumentation: There is no instrumentation at the dam site.

3.2 Evaluation: In general, the dam and appurtenant structures are in fair condition. On the upstream embankment, riprap should be placed extending into the water and above the principal spillway inlet elevation. The remaining areas of erosion should be filled, compacted, reseeded and mulched.

On the downstream embankment, reseeding should satisfactorily retard further erosion of the sparsely vegetated areas. Regular grass cutting would provide a good mulch for erosion protection.

Due to significant foot traffic on the crest, seeding may be practical only if a paved footpath is provided. The low area to the left of the left abutment should be filled and compacted, and then reseeded and mulched. The lower half of the junction of the left abutment and the downstream embankment, where the two-foot deep gully has formed, should be backfilled, compacted and riprapped. The eroded areas between the paved spillway discharge channel and the downstream embankment should be filled, compacted, reseeded and mulched to stop the erosion.

The seeps along the spillway discharge channel may not represent seeps through the embankment, but may instead be leakage that has made its way under the concrete lining of the spillway. The outlets for the toe drain are located unusually high on the embankment and may not have been constructed properly. Their as-built

NAME OF DAM: SALISBURY LAKE DAM

locations do not agree with those shown on the design plans. The embankment should be periodically inspected for detrimental seepage. A trash rack should be installed on the intake structure of the principal spillway to prevent plugging of the inlet.

The eroded areas to the right of the spillway discharge channel should be filled, compacted and reseeded. Areas adjacent to the discharge channel should be periodically checked for erosion and, if necessary, stabilized with vegetation or riprap. A staff gage should be installed to monitor reservoir levels above normal pool.

NAME OF DAM: SALISBURY LAKE DAM

#### SECTION 4 - OPERATIONAL PROCEDURES

- 4.1 Procedures: The normal reservoir elevation of 305.0 feet T.B.M. is maintained by the crest of the principal spillway intake structure. The reservoir elevation can be lowered to approximately 298.2 feet T.B.M. by use of the emergency gate.
- 4.2 Maintenance of Dam: Maintenance of the dam is the responsibility of the owner. An inspection or maintenance schedule has not been instituted.
- 4.3 Maintenance of Operating Facilities: The only operating facility at the dam at the time of inspection was the emergency gate. The maintenance of this operating facility is the responsibility of the owner. An inspection, testing or maintenance schedule has not been instituted.
- 4.4 Warning System: At the time of inspection, there was no warning system or emergency action plan in operation.
- 4.5 Evaluation: Maintenance of the dam and operating facilities in the past has been inadequate. Inspections of the dam and appurtenant structures should be made on a regular basis. A thorough check list should be compiled for use by the owner's representative as a guide for the inspections. A warning system and emergency action plan should be developed and implemented as soon as possible.

NAME OF DAM: SALISBURY LAKE DAM

## SECTION 5 - HYDRAULIC/HYDROLOGIC DATA

- 5.1 Design: No hydraulic or hydrologic design data were available for use in preparing this report.
- 5.2 Hydrologic Information: No rainfall, stream gage or reservoir stage records are maintained for this dam.
- 5.3 Flood Experience: No records were available.
- 5.4 Flood Potential: The Probable Maximum Flood (PMF) and the 1/2 Probable Maximum Flood (1/2 PMF) were developed and routed through the reservoir by use of the HEC-1 DB computer program (Reference 9, Appendix IV) and appropriate unit hydrograph, precipitation and storage-outflow data. Clark's  $T_c$  and R coefficients for the local drainage areas were estimated from basin characteristics. The rainfall applied to the unit hydrograph was taken from a publication by the National Oceanic and Atmospheric Administration (Reference 17, Appendix IV). Rainfall losses for the PMF were estimated at an initial loss of 1.0 inches and a constant loss rate of 0.05 inches per hour thereafter.
- 5.5 Reservoir Regulation: Pertinent dam and reservoir data are shown in Table 1.1, paragraph 1.3.3.

Regulation of flow from the reservoir is automatic. Normal flows are maintained by the crest of the principal spillway intake structure at elevation 305.0 feet T.B.M. Water also flows past the dam through the ungated emergency spillway in the event water in the reservoir rises above an elevation of 305.5 feet T.B.M.

Outlet discharge capacity was computed by hand. Reservoir area was planimetered from the Midlothian, Virginia, 7.5 minute USGS quadrangle, and storage capacity was computed by the HEC-1 DB program. Outlet discharge capacity and storage capacity curves were computed to elevations above the crest of the dam. All flood routings were begun with the reservoir level at normal pool. Flow through the principal spillway was included in the routings.

- 5.6 Overtopping Potential: The probable rise of the reservoir and other pertinent information on reservoir performance are shown in the following table:

NAME OF DAM: SALISBURY LAKE DAM

TABLE 5.1 RESERVOIR PERFORMANCE

Item	Normal <sup>1</sup>	Hydrographs	
		1/2 PMF	PMF <sup>2</sup>
Peak flow, c.f.s.			
Inflow	5	4,984	9,968
Outflow	5	4,364	9,769
Peak elev., ft. T.B.M	305.2	311.7	312.7
Emergency spillway (elev. 305.5 ft. T.B.M.)			
Depth of flow, ft.	-	6.2	7.2
Average velocity, f.p.s. <sup>3</sup>	-	11.5	12.4
Duration of flow, hrs.	-	12.5	14.7
Non-overflow section (min. elev. 310.3 ft. T.B.M.)			
Depth of flow, ft.	-	1.4	2.4
Average velocity, f.p.s. <sup>3</sup>	-	5.5	7.2
Total duration of over- topping, hrs.	-	2.8	4.7
Tailwater elev., ft. T.B.M.	274.9	-	-

<sup>1</sup> Conditions at time of inspection.

<sup>2</sup> The PMF is an estimate of flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in a region.

<sup>3</sup> Velocity estimates were based on critical depth at control section.

5.7 Reservoir Emptying Potential: The elevation of the reservoir can be lowered to an elevation of 298.3 feet T.B.M. by means of the 24 inch emergency gate on the principal spillway intake structure. Neglecting inflow, the reservoir can be drawn down from normal pool, at elevation 305.0 feet T.B.M., to the invert of the emergency gate, at elevation 298.3 feet T.B.M., in approximately 16 days. This is equivalent to a drawdown rate of 0.4 feet per day, based on the hydraulic height measured from normal pool divided by the time to lower the reservoir elevation to 298.3 feet T.B.M.

5.8 Evaluation: Salisbury Lake Dam is a "small" size - "high" hazard dam requiring evaluation for a spillway design flood (SDF) in the range between the 1/2 PMF and the PMF. Due to the risk involved, the PMF has been selected

NAME OF DAM: SALISBURY LAKE DAM



as the SDF. The PMF was routed through the reservoir and found to overtop the dam by a maximum depth of 2.4 feet for a total duration of 4.7 hours with an average critical velocity of 7.2 f.p.s. The spillways are capable of passing up to 30 percent of the PMF without overtopping the crest of the dam.

Conclusions pertain to present conditions and the effect of future development on the hydrology has not been considered.

NAME OF DAM: SALISBURY LAKE DAM

## SECTION 6 - DAM STABILITY

6.1 Foundation and Abutments: No previous information describing local subsurface conditions was available for the visual inspection or subsequent analyses. The dam is located in the Piedmont physiographic province of Virginia. The topography of the Piedmont generally consists of rolling hills and gentle slopes with relief less than 150 feet. The Vinta formation of the Newark group, Triassic period, is shown on the Geologic Map of Virginia (Reference 4, Appendix IV) as underlying the dam. The formation is not described; however, the Newark group is largely comprised of sedimentary rock. Bedrock outcrops were not observed in the area of the dam. Gray clay with sand inclusions was noted on the right abutment of the dam near the water line. This clay is overlain by sand and gravel which is probably Tertiary or Quaternary period material that is shown on the State geologic map as occurring nearby. According to available design plans, the dam was keyed to a maximum of 20 feet below existing grade, or to solid rock, or to an adequate layer of impermeable material with a clay core, as approved by the owner's engineer. The core material was obtained locally from the reservoir area and/or transported to the dam as required.

### 6.2 Embankment

6.2.1 Materials: Little information describing the nature of the embankment materials was available for this inspection. The dam is a zoned earthfill type with a compacted clay core, according to the design plans. The core is reportedly 5 feet wide just beneath the dam crest and widens at a 1H:1V slope to approximately 75 feet at the base of the dam. This core extends a maximum of 20 feet beneath the dam in a trapezoidal-shaped key trench. The outer embankment materials are not described, but gray clay was observed at an eroded area just above the water line on the upstream embankment during the visual inspection (probably CH group soil-Unified Classification System). The outermost embankment materials appeared to be very gravelly (estimated to be GC group soil).

6.2.2 Stability: The results of a previous stability analysis were not available for reference during this evaluation. As discussed

NAME OF DAM: SALISBURY LAKE DAM

above, the structure is a zoned earthfill type generally containing a "minimum core A" as described in Design of Small Dams by the U.S. Department of the Interior, Bureau of Reclamation (Reference 1, Appendix IV). The dam is 37.3 feet high with a minimum crest width of approximately 15 feet. The upstream embankment slope is shown on the available design plans as 3H:1V with a 6 foot wide bench at normal pool elevation. The recent field check conducted during these investigations measured the upstream slope as being 2.5H:1V. The downstream embankment slope is also shown as 3.4H:1V, which agrees with the slope measured during the visual inspection. The reservoir can only be drawn down 7 feet below normal pool (elevation 305 feet T.B.M.) using the emergency gate on the principal spillway intake structure. The drawdown rate is 0.4 feet per day which is less than the critical rate of 0.5 feet per day for earth dams. The upstream toe of the dam is reported to be at elevation 276 feet.

According to guidelines discussed in Design of Small Dams, the upstream and downstream embankment slopes for a small zoned earthfill dam situated on a stable foundation, with a "minimum core A", should both be 2H:1V. Since minimal dewatering of the impoundment is possible and drawdown rates are less than the critical rate, rapid drawdown considerations are not necessary. A crest width of 17.6 feet is recommended, considering the height of the dam. Based on these guidelines, the slopes of the embankment are satisfactory. The crest is slightly inadequate in some areas.

No signs of instability in the dam, such as slumping, tension cracks, or unusual alignment along the crest, were observed during the visual inspection. However, the upstream embankment is moderately eroded (see Photo 6) from runoff and wave action. The downstream embankment is slightly to moderately eroded. Also, the junctions of the downstream embankment with the abutments have been eroded. The erosion of the left junction has resulted in a ditch 2 feet deep (see Photo 7). A toe drain was provided to control seepage through

NAME OF DAM: SALISBURY LAKE DAM

the dam; however, the outlets are situated unusually high on the embankment. A very minor seep was observed from the downstream embankment immediately below the headwall for the toe drain outlets (see Plate 1).

6.2.3 Seismic Stability: The dam is located in Seismic Zone 1 which presents no hazard from earthquakes, according to the Recommended Guidelines for Safety Inspection of Dams by the Department of the Army, Office of the Chief of Engineers. This determination is contingent on the requirements that static stability conditions are satisfactory and conventional safety margins exist.

6.3 Evaluation: No previous stability analyses were available for comparison as part of this evaluation of Salisbury Lake Dam. The embankment design is satisfactory compared to guidelines by the Bureau of Reclamation, with the exception that the crest width is slightly inadequate in some areas. The visual inspection did not reveal any signs of instability. However, the erosion of the upstream and downstream embankments and the downstream junction areas must be corrected to ensure continued stability. The toe drain outlets are located unusually high on the embankment. Their as-built locations do not agree with those shown on the design plans. It is questionable whether the toe drain was constructed properly. The downstream toe of the dam should be checked periodically for seepage. A stability analysis is not considered necessary at this time.

As described in Section 5 of this report, the dam would be overtopped by the SDF, which has been chosen to be the PMF. The SDF would overtop the dam by a maximum depth of 2.4 feet for a total duration of 4.7 hours with an average critical velocity of 7.2 feet per second (f.p.s.). The velocity exceeds the effective eroding velocity for a vegetated earth embankment of 6.0 f.p.s. The depth, duration, and rate of overtopping flows for the SDF are considered detrimental to the embankment.

The 1/2 PMF would overtop the dam by a maximum depth of 1.4 feet for a total duration of 2.8 hours with an average critical velocity of 5.5 f.p.s. The depth, duration, and rate of overtopping flows for the 1/2 PMF are considered detrimental to the embankment, considering its present eroded and sparsely vegetated condition.

NAME OF DAM: SALISBURY LAKE DAM

BIANK

## SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

- 7.1 Dam Assessment: An incomplete set of design drawings for the dam and appurtenant structures and a design drawing for repairs to areas adjacent to the spillway discharge channel were obtained from the designer of the dam. No other engineering data were available for use in preparing this report. Deficiencies discovered during the field inspection and office analyses will require remedial treatment. The dam and appurtenant structures are generally in fair condition. Maintenance of the dam is considered inadequate. A stability check is not required.

Using the Corps of Engineers' screening criteria for initial review of spillway adequacy, the PMF was selected as the SDF for the "small" size - "high" hazard classification of Salisbury Lake Dam. The dam would be overtopped by the SDF, and the depth, duration, and rate of overtopping flows are considered detrimental to the embankment. The spillways are capable of passing only 30 percent of the PMF.

The spillway is adjudged as seriously inadequate, since dam failure from overtopping would significantly increase the hazard to loss of life downstream from the dam over that which would exist just before overtopping failure. There is no riprap protection on the upstream embankment and wave action has created a vertical scarp at the waterline. Due to the lack of adequate vegetative cover, erosion is occurring in scattered areas along the crest, the downstream embankment, and the spillway discharge channels. A minor seep was observed below the outlet of the toe drain and two adjacent seeps were observed along the lower section of the spillway discharge channel. Some debris has collected around the base of the principal spillway intake structure and the emergency gate is in poor condition. The dam is assessed as unsafe, non-emergency.

There is currently no warning system or emergency action plan in operation.

- 7.2 Recommended Remedial Measures: It is recommended that, within two months of the date of notification of the Governor of the Commonwealth of Virginia, the owner engage the services of a professional engineering consultant to determine by more sophisticated methods and procedures the adequacy of the spillways. The

NAME OF DAM: SALISBURY LAKE DAM

study should include a more detailed study of the downstream floodplain and of the spillway design flood appropriate to this dam. Remedial measures to be considered include modification of the dam, spillway, floodplain, and/or any other method of eliminating the danger imposed by the project.

Within six months of the notification of the Governor, the consultant's report of appropriate remedial mitigating measures should have been completed and the owner should have an agreement with the Commonwealth of Virginia for a reasonable time frame in which all remedial measures will be complete.

Until corrective measures are completed, the dam should be checked during periods of heavy runoff. The seeps near the outlet of the toe drain and in the lower portion of the spillway discharge channel should be periodically checked and recorded. Monitoring of the flow rate and turbidity is recommended. If turbidity or increased flow is noted, a qualified geotechnical engineering firm should be retained to perform a stability check of the dam. If evidence of piping of embankment material is found or if dam overtopping is imminent, warning should be issued to the downstream inhabitants.

In the interim, an emergency action plan and warning system should be promptly developed. It is recommended that a formal emergency procedure be prepared, prominently displayed, and furnished to all operating personnel. This should include:

- 1) How to operate the dam during an emergency.
- 2) Whom to notify, including public officials, in case evacuation from the downstream area is necessary.
- 3) Procedures to evaluate inflow during periods of emergency operation.

Regular inspections should be made of the dam and appurtenant structures. A thorough checklist should be compiled for use by the owner's representative as a guide for the inspections. Maintenance items should be completed annually.

The following items can be accomplished as part of the general maintenance of the dam:

NAME OF DAM: SALISBURY LAKE DAM

- 1) Place riprap on the upstream embankment, extending into the water and above the principal spillway inlet elevation. Fill, compact, reseed, and mulch the remaining portion of the upstream embankment.
- 2) Mulch and reseed the crest of the dam and sparsely vegetated areas on the downstream embankment.
- 3) Fill, compact, seed, and mulch the low area to the left of the left abutment.
- 4) Fill, compact, and riprap the two foot deep gully along the junction of the downstream embankment with the left abutment.
- 5) Fill, compact, reseed, and mulch the eroded areas adjacent to the discharge channels of both the principal and emergency spillways.
- 6) Install a trash rack on the intake structure of the principal spillway.
- 7) Install a staff gage to monitor reservoir levels above normal pool.

The owner of the dam has been in contact with the engineer of record for this dam and has indicated that a mutually agreeable plan will be devised to remedy deficiencies noted in this report. (See Appendix IV - Pertinent Correspondence).

NAME OF DAM: SALISBURY LAKE DAM



APPENDIX I

PLATES

## CONTENTS

Location Plan

Plate 1: Field Sketch

Plate 2: Plan, Profiles, and Typical Sections (1968)

Plate 3: Miscellaneous Details and Notes (1968)

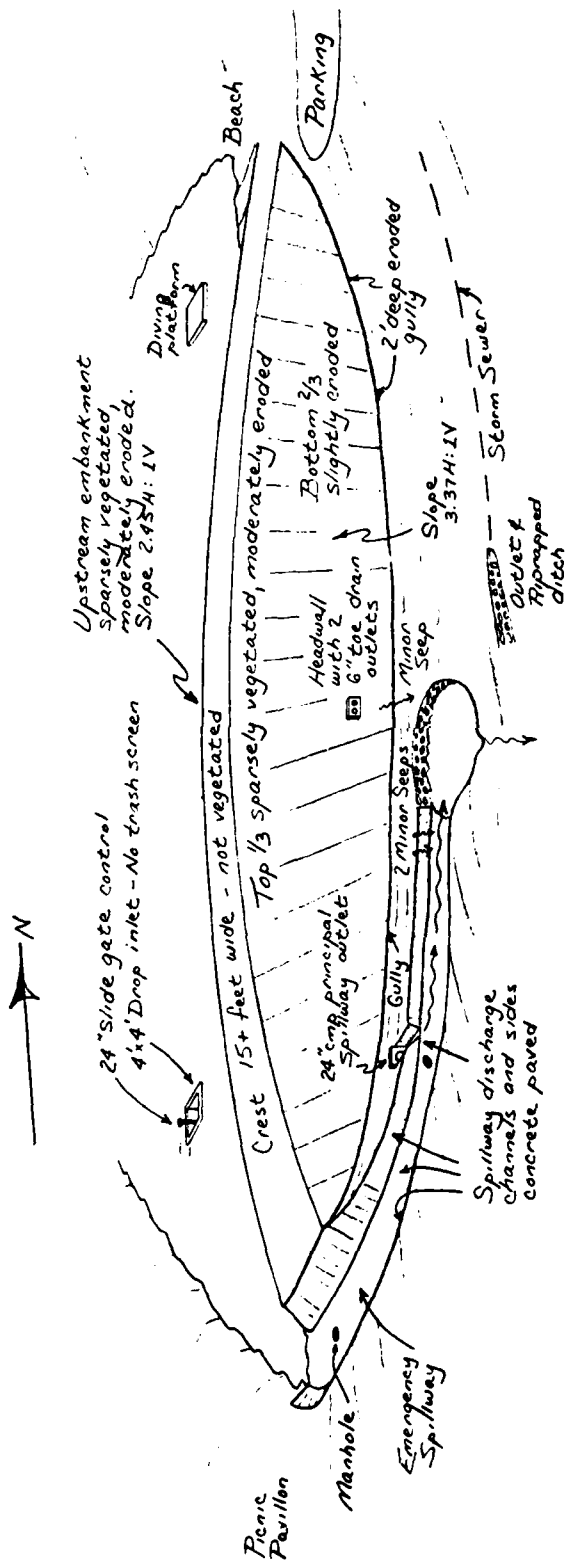
Plate 4: Lake Salisbury Dam Repairs - Plan and Details (1980)

Plate 5: Top of Dam Profile and Typical Cross Section

NAME OF DAM: SALISBURY LAKE DAM



- Not to Scale -



# FIELD SKETCH

SALISBURY LAKE DAM, VIRGINIA

Michael Baker, Jr., Inc.

10 November 1980

PLATE 1

DWH 11-80

E DAM  
 L = 44' 40" 1/2"  
 R = 55' 10"  
 L = 574.10  
 T = 201.45

452,566.00  
 2248,552.00

452,828.00  
 2248,552.00

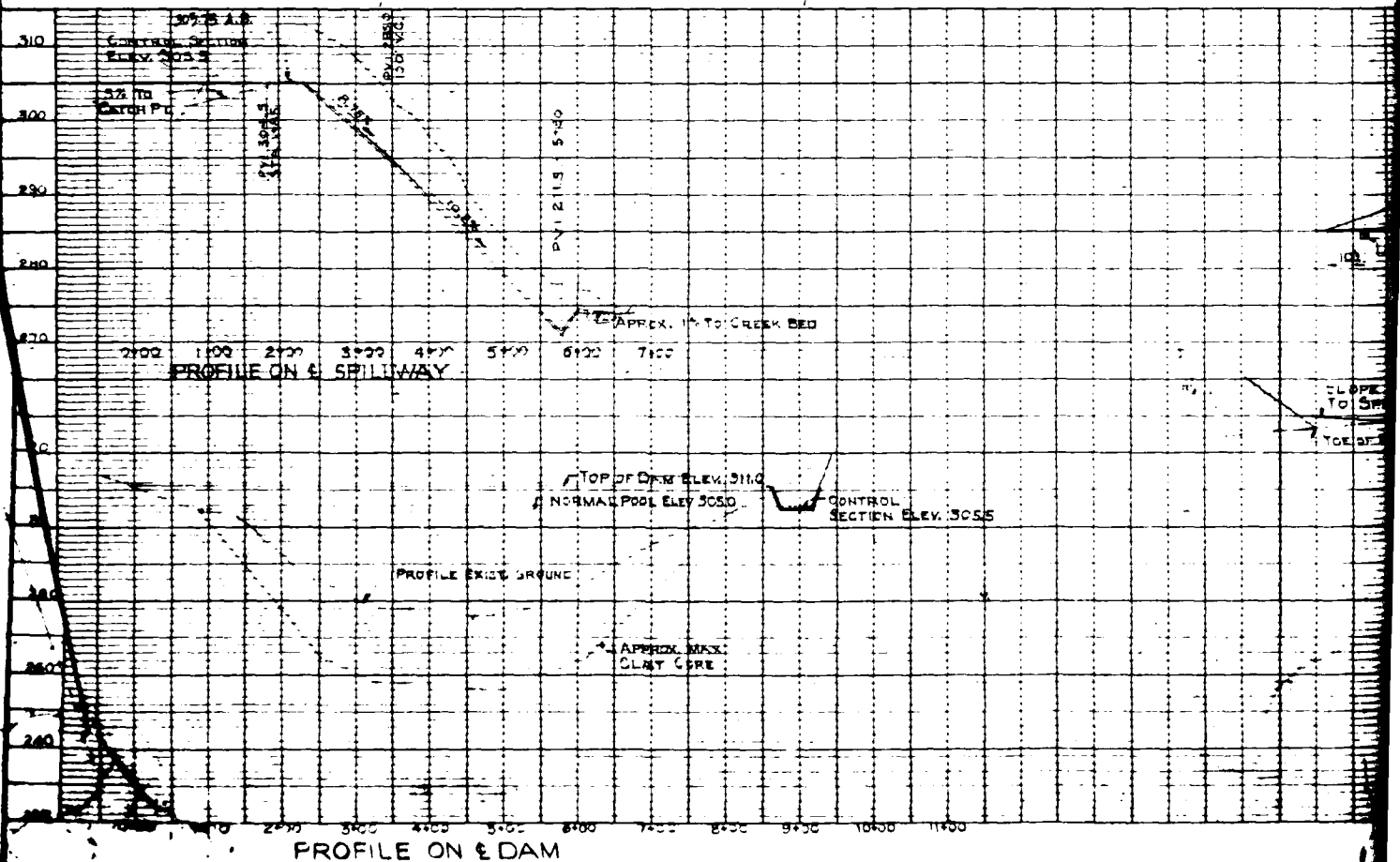
DUMPED R. RAP

TOE DRAIN DITCH TO CREEK AS REQD

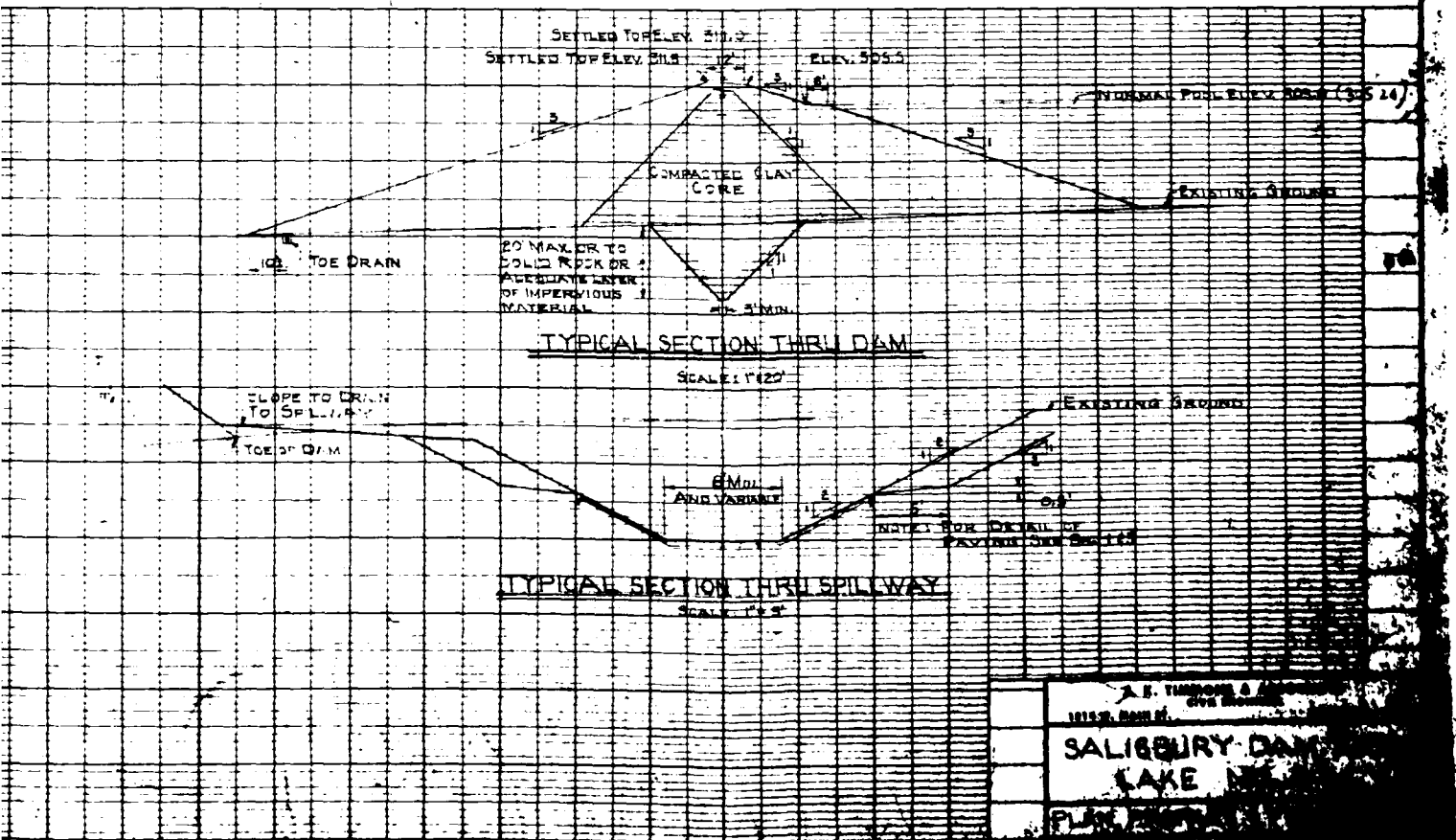
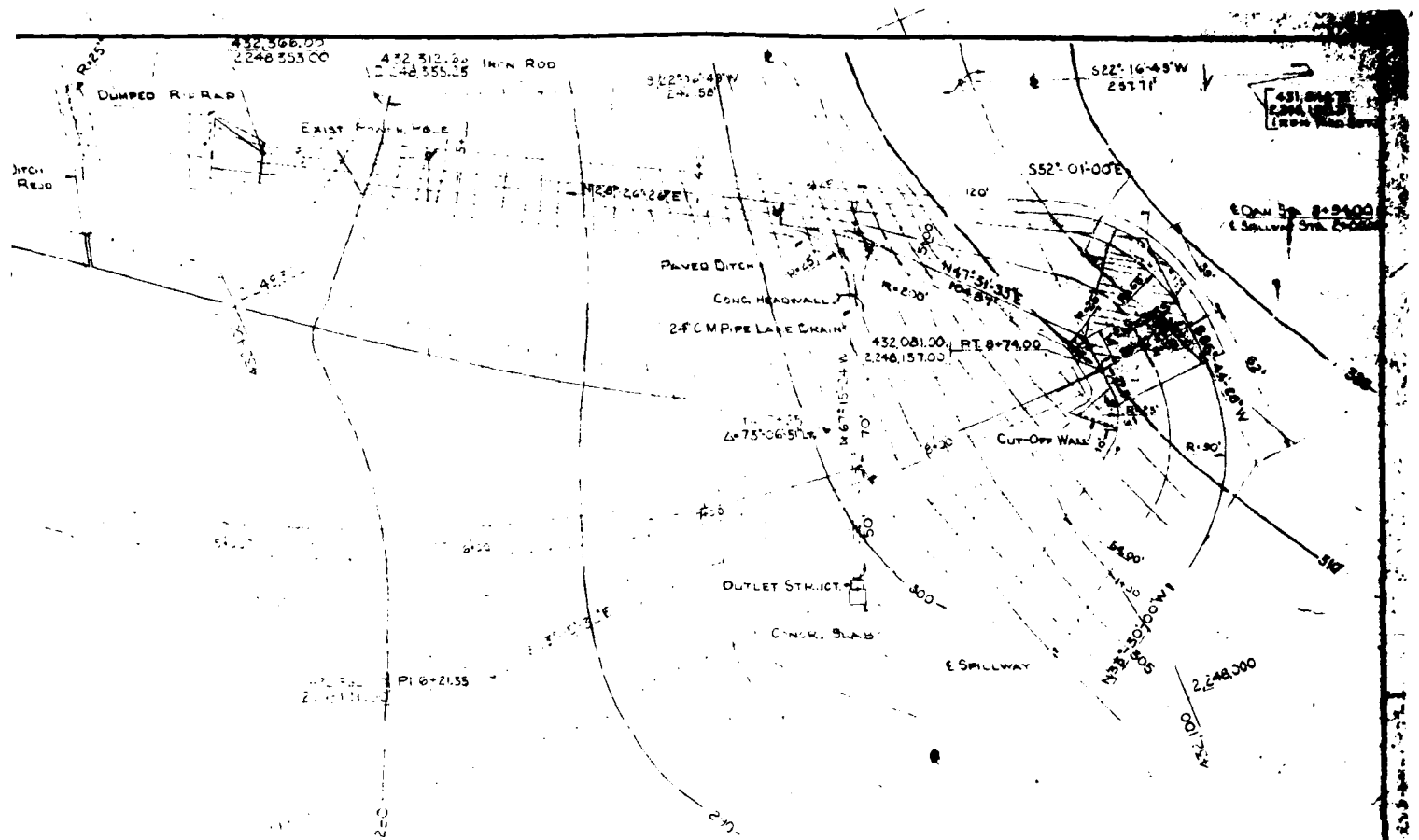
TOE DRAIN  
 PRO. LE. HENCE ELEV  
 OF TOE 16 BELOW 225

LIMITS OF CULVERTING  
 FOR POND AREA

100	100	100
200	200	200
300	300	300
400	400	400
500	500	500
600	600	600
700	700	700
800	800	800
900	900	900
1000	1000	1000
1100	1100	1100
1200	1200	1200
1300	1300	1300
1400	1400	1400
1500	1500	1500
1600	1600	1600
1700	1700	1700
1800	1800	1800
1900	1900	1900
2000	2000	2000
2100	2100	2100
2200	2200	2200
2300	2300	2300
2400	2400	2400
2500	2500	2500
2600	2600	2600
2700	2700	2700
2800	2800	2800
2900	2900	2900
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3200	3200	3200
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3900	3900	3900
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4100	4100	4100
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4400	4400	4400
4500	4500	4500
4600	4600	4600
4700	4700	4700
4800	4800	4800
4900	4900	4900
5000	5000	5000
5100	5100	5100
5200	5200	5200
5300	5300	5300
5400	5400	5400
5500	5500	5500
5600	5600	5600
5700	5700	5700
5800	5800	5800
5900	5900	5900
6000	6000	6000
6100	6100	6100
6200	6200	6200
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6500	6500	6500
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7000	7000	7000
7100	7100	7100
7200	7200	7200
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8400	8400	8400
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8600	8600	8600
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9000	9000	9000
9100	9100	9100
9200	9200	9200
9300	9300	9300
9400	9400	9400
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9800	9800	9800
9900	9900	9900
10000	10000	10000



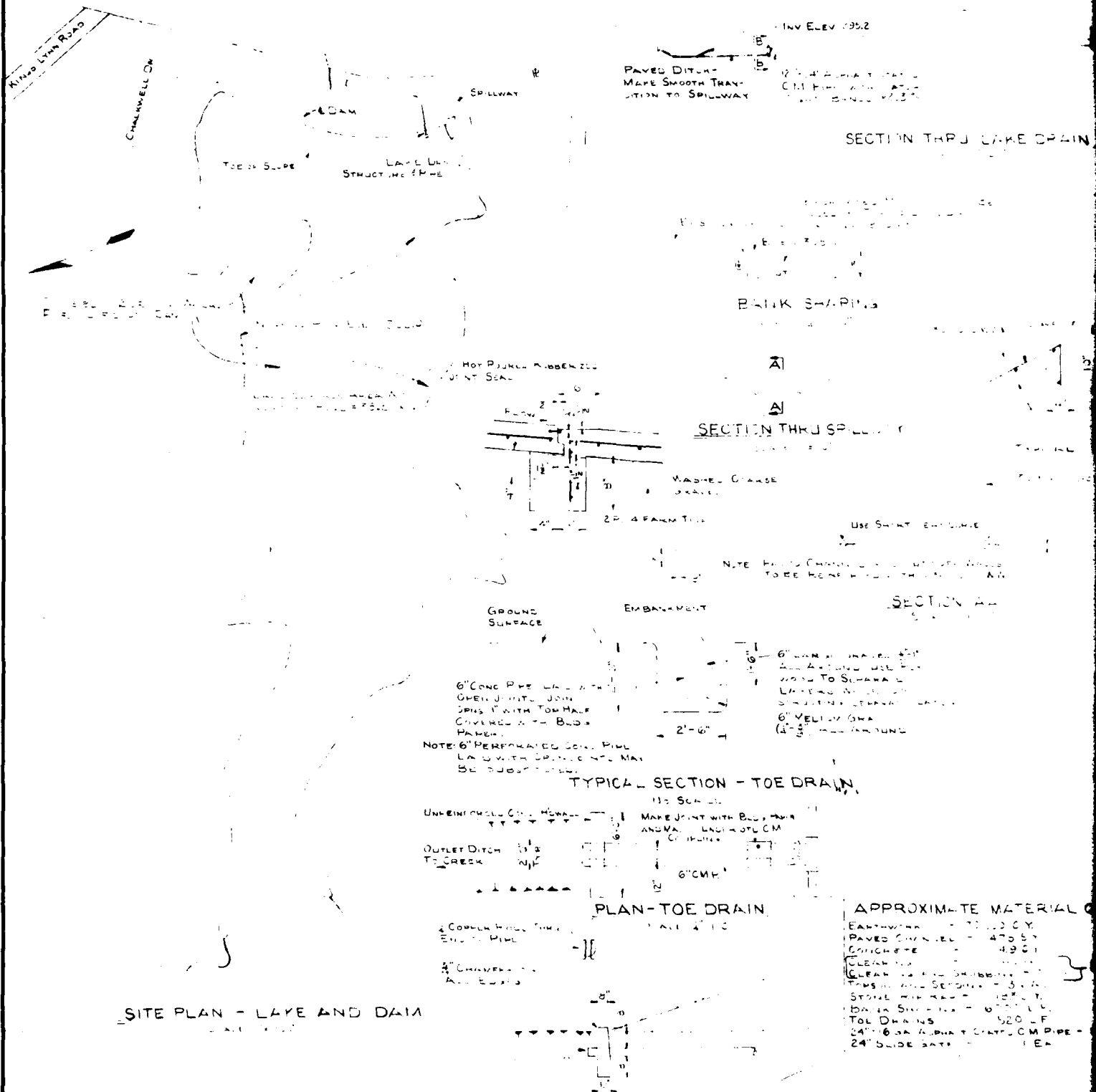
PROFILE ON & DAM



12

PLATE 2

A. E. THOMPSON & SONS  
 1815 E. MAIN ST.  
**SALISBURY DAM**  
**LAKE NE**  
 PLAN



\*TO ESTABLISH SLOPE ONLY CENTER HAS 3" OFF CENTER FROM 140 BE ALLOWED.

LEV 35.2

PAVING  
FILL WITH GRAVEL  
T. 5-100-100.3

# SECTION THRU LAKE DRAIN

## SECTION BB Scale 3/8" = 1'

## SECTION THRU OUTLET STRUCTURE Scale 3/8" = 1'

## SECTION AA Scale 3/8" = 1'

### APPROXIMATE MATERIAL QUANTITIES

EARTHWORK - 70,000 CY  
PAVED CHANNEL - 470 SY  
CONCRETE - 4,900  
CLEANING - 1000  
CLEANING AND DRAINAGE - 1000  
PUMPING AND DETENTION - 1000  
STONE FILL - 1000 CY  
DRAIN SHAFTS - 600 LF  
TOD DRAINS - 520 LF  
24" 6 IN ALPHA CAST IRON PIPE - 120 LF  
24" SLIDE GATE - 1 EA

BY OTHERS

\*To Establish Slope Only. Center Line  
Has 3' on Dump Sum. 110' EARTH  
BE ALLOWED.

PLATE 3

### GENERAL NOTES

DAM AND SPILLWAY SITE SHALL BE CLEARED AND  
IMPROVED AND AFTER CONSTRUCTION ALL DISTURBED  
AREAS SHALL BE THOROUGHLY AND SEEDS EXCEPT  
THAT PORT OF LIES BELOW PLANNED POOL  
ELEVATION OF THE UPS RIAM SURFACE  
OF THE DAM  
IF AN INUNDATED AT PERMANENT POOL PLUS A  
THREE FOOT WALL STRIP ALL AROUND THE LAKE  
SHALL BE CLEARED FLUSH WITH THE GROUND.  
MATERIAL TO BE USED IN EACH AREA OF DAM  
TO BE APPROVED BY THE ENGINEER  
EMBANKMENT TO BE COMPACTED TO 95% OF  
MAXIMUM DENSITY BASED UPON DEPT. OF  
HIGHWAYS SPECIFICATION  
ALL EMBANKMENTS SHALL BE 3000 PSI ARE AND SHALL  
HAVE A DRAIN OF FROM 2' TO 4' ALL CONCRETE  
SHALL BE PROTECTED AGAINST FREEZING AND  
CRACKING BY COVERING WITH 6" OF FINE A PERIOD  
OF 10 DAYS AFTER PLACING CONCRETE INCLUD-  
ING THAT FOR IN THE SPILLWAY CHANNEL SHALL  
BE SHAD 1000 IN 1000 FEET TO  
BE PROTECTED FROM  
IF EMBANKMENTS HAVE BEEN BUILT AND/OR AFTER  
CHANNELS HAVE BEEN PREPARED FOR CONCRETE  
THE EMBANKMENTS SHALL BE THOROUGHLY SATURATED  
WITH WATER TO PREVENT LOSS OF CONCRETE  
DURING THE CURE PERIODS  
ALL DRAINAGE DRAINAGE SHALL BE REASONABLY  
DESIGNED

J. R. TIMMONS & ASSOCIATES  
CIVIL ENGINEERS

1214 W. MAIN ST.

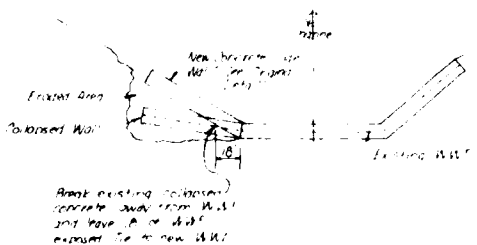
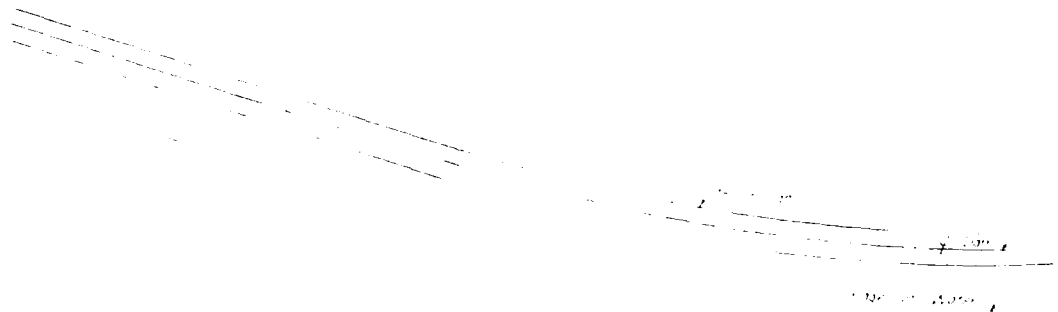
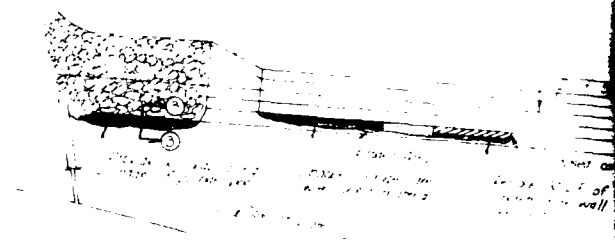
OSHTON, MD.

SALISBURY DAM AND  
LAKE NO. 2

MISCELLANEOUS DETAILS (NOT)

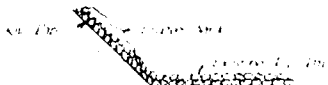
DATE 2/7/68	REVISION	
BY J.R.T.		
CHECKED J.R.T.		
APPROVED J.R.T.		



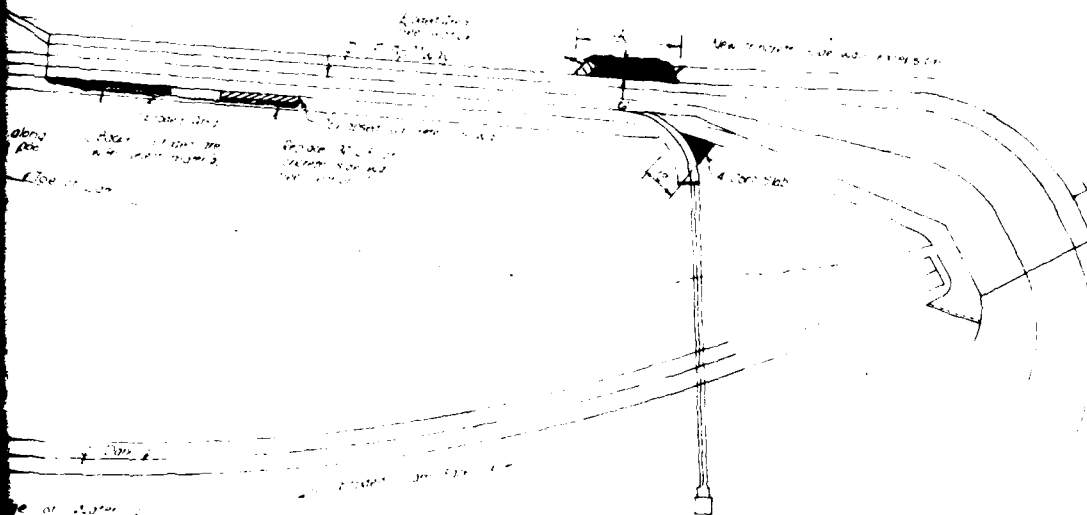


Break existing (concrete)  
concrete away from wall  
and have it in place  
replaced to new wall

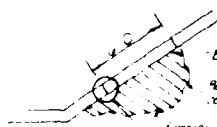
SECTION 2



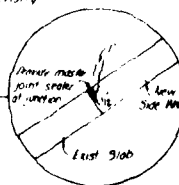
SECTION 3 3



East  
North



Extend concrete sidewalk  
Backfill with select material and  
compact to 95% maximum density  
Embankment and sidewalk



SECTION 1

## PLATE 4

J. K. TIMMONS & ASSOCIATES, INC.  
CONSULTING ENGINEERS  
1314 W. MAIN ST. RICHMOND, VA.

### LAKE SALISBURY DAM REPAIRS

PLAN AND DETAILS

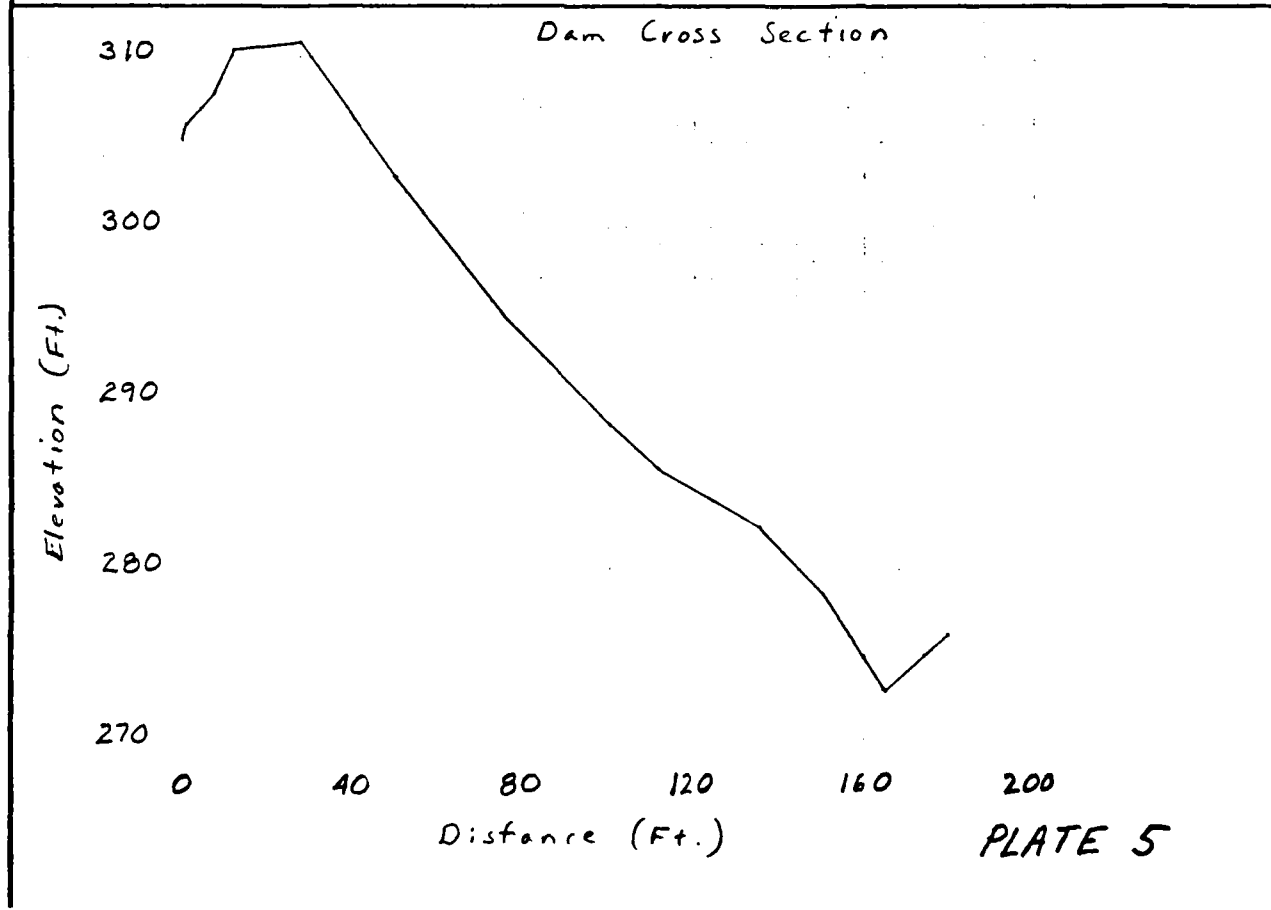
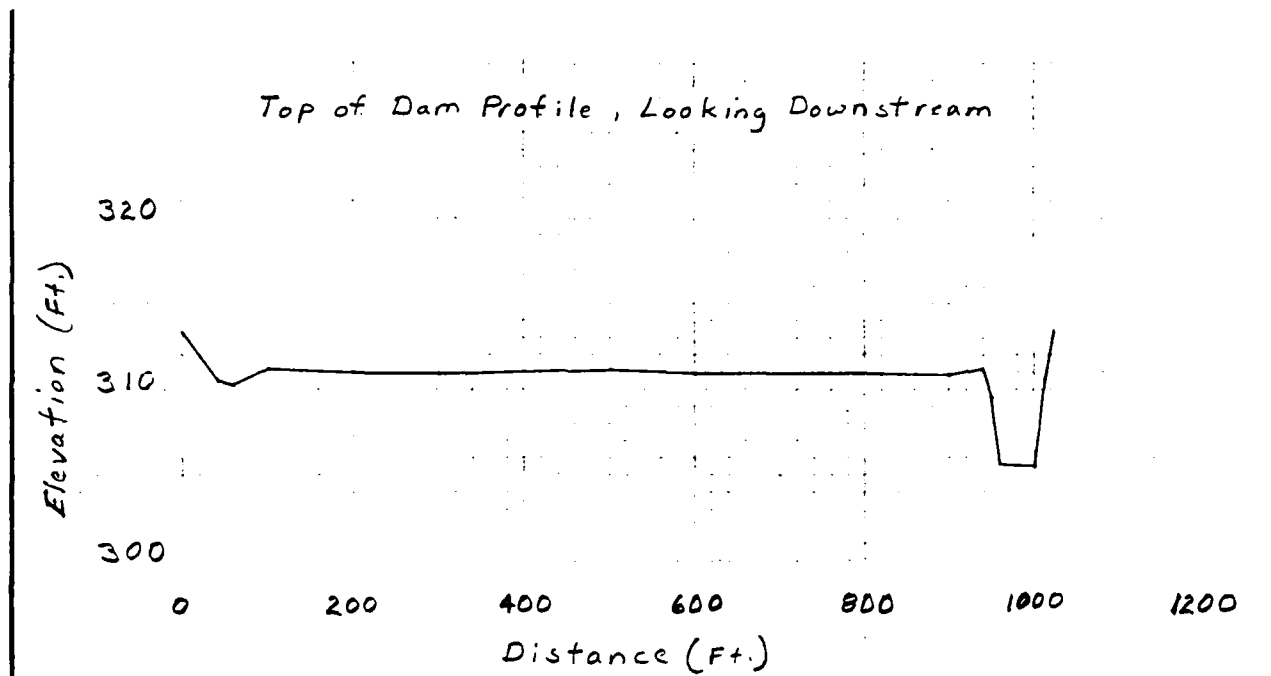
DATE: APRIL 9, 1960  
SCALE: 1" = 20'  
DESIGNED: RER  
DRAWN: JSD  
CHECKED: RER

REVISIONS

SHEET

1 OF 1

D.N. 516-16



APPENDIX II  
PHOTOGRAPHS

## CONTENTS

- Photo 1: Principal Spillway Drop Inlet, Slide Gate Control
- Photo 2: Principal Spillway Outlet, Emergency Spillway Discharge Channel
- Photo 3: Stilling Basin, Emergency and Principal Spillway Discharge Channnel
- Photo 4: Position of Toe Drain Outlet Headwall on Downstream Embankment
- Photo 5: Toe Drain Outlets
- Photo 6: Eroded Upstream Face of Embankment, Sparse Vegetation
- Photo 7: Erosion along Junction of Downstream Face of Embankment with Left Abutment
- Photo 8: Seeps along Discharge Channel for Spillways

Note: Photographs were taken on 10 November 1980.

NAME OF DAM: SALISBURY LAKE DAM

## **SALISBURY LAKE DAM**



**PHOTO 1. Principal Spillway Drop Inlet, Slide Gate Control**



**PHOTO 2. Principal Spillway Outlet, Emergency Spillway Discharge Channel**

## **SALISBURY LAKE DAM**

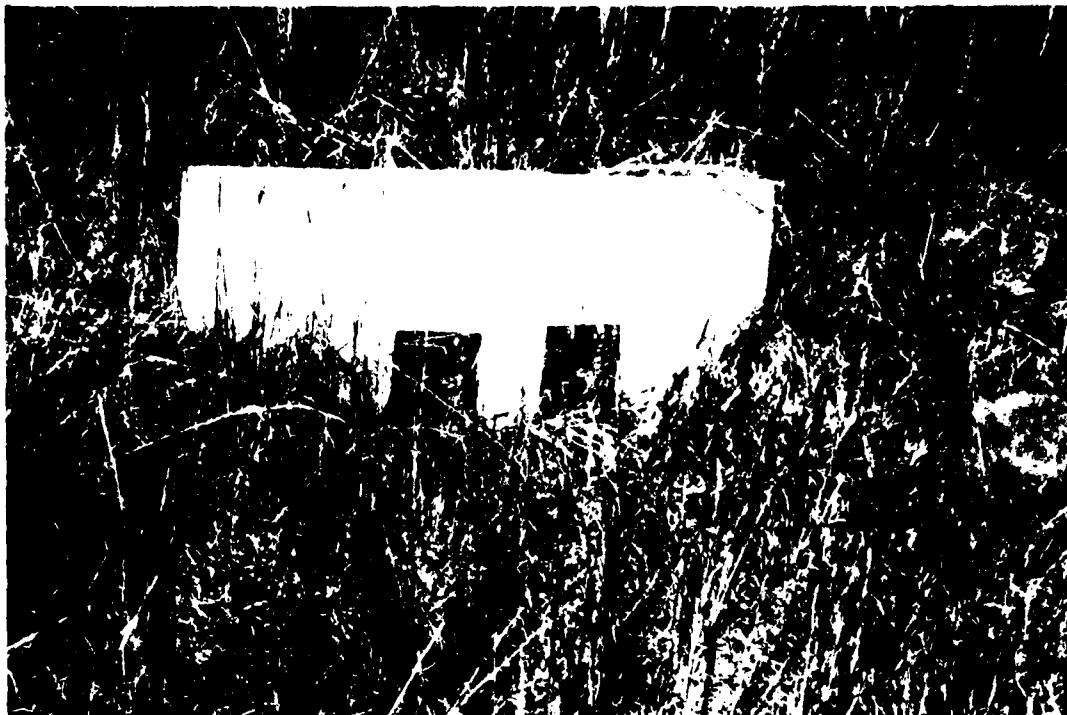


**PHOTO 3. Stilling Basin, Emergency and Principal Spillway  
Discharge Channel**



**PHOTO 4. Position of Toe Drain Outlet Headwall on Downstream  
Embankment**

**SALISBURY LAKE DAM**



**PHOTO 5. Toe Drain Outlets**



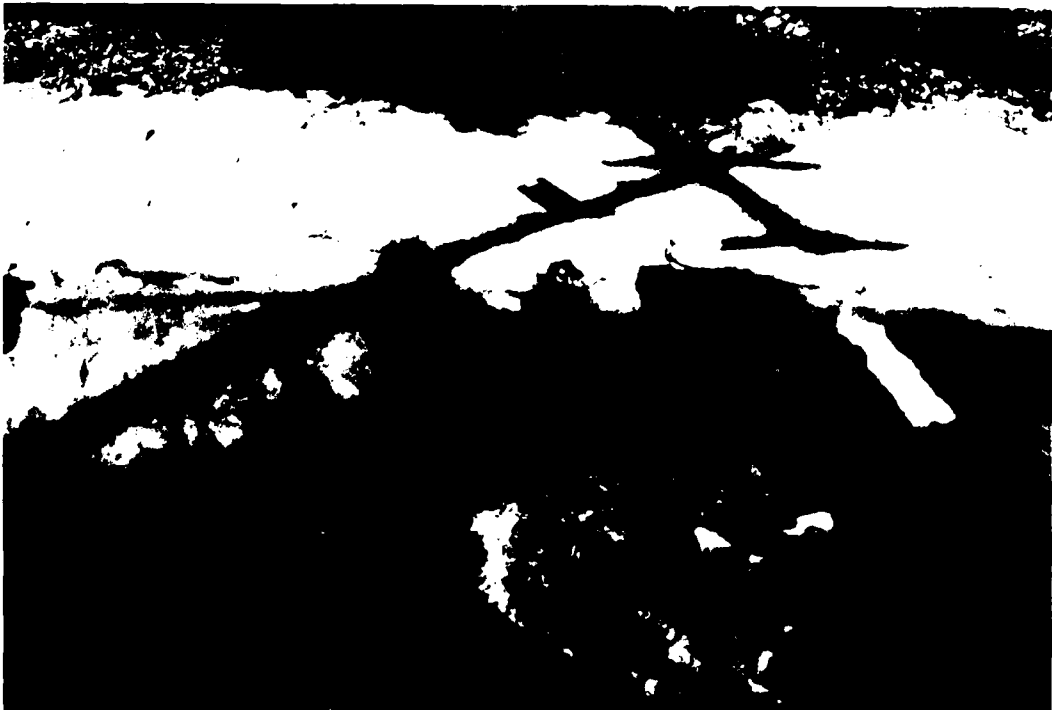
**PHOTO 6. Eroded Upstream Face of Embankment, Sparse Vegetation**



## **SALISBURY LAKE DAM**



**PHOTO 7. Erosion along Junction of Downstream Face of Embankment  
with Left Abutment**



**PHOTO 8. Seeps along Discharge Channel for Spillways**

APPENDIX III  
VISUAL INSPECTION CHECK LIST

Check List  
Visual Inspection  
Phase 1

Name of Dam Salisbury Lake County Chesterfield State Virginia Coordinates Lat. 3731.1  
Dam Long. 7738.6

Date of Inspection 10 November 1980 Weather Clear - Sunny Temperature 55° F.

Pool Elevation at Time of Inspection 305.2 ft. T.B.M.\* Tailwater at Time of Inspection 274.9 ft. T.B.M.

\*All elevations are referenced to the emergency spillway crest elevation. Design elevation of this point is 305.5 ft. Temporary Bench Mark (T.B.M.).

Inspection Personnel:

Michael Baker, Jr., Inc.:

Jeff Quay  
H.P. Lim  
David Hupe

Owner's Representatives:

None present

Virginia State Water Control Board:

Leon Musselwhite

David Hupe Recorder

# EMBANKMENT

Name of Dam : SALISBURY LAKE DAM

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	No surface cracks were observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	The upstream embankment is moderately eroded and sparsely vegetated with high grass. Wave action is resulting in the formation of a vertical scarp in the embankment, about 1 foot high, at the water line. Riprap was not provided on the upstream embankment for protection from erosion.	On the upstream embankment, riprap should be placed extending into the water and above the principal spillway inlet elevation. The remaining eroded areas should be filled, compacted, reseeded and mulched.

# EMBANKMENT

Name of Dam: SALISBURY LAKE DAM

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES (continued)	<p>The downstream embankment is slightly to moderately eroded. It is generally better vegetated than the upstream embankment. The upper third of the downstream embankment is not well vegetated and is moderately eroded.</p> <p>The crest of the dam is unvegetated and unprotected.</p>	<p>On the downstream embankment, reseeding should satisfactorily retard further erosion of the sparsely vegetated areas. Regular grass cutting would provide a good mulch for the erosion protection.</p> <p>Due to significant foot traffic on the crest, seeding may be practical only if a paved foot path is provided.</p>
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	<p>The vertical and horizontal alignments of the crest are generally satisfactory, although a slight depression to the left of the left abutment has been caused by recent grading.</p>	<p>The low area to the left of the left abutment should be filled and compacted, then reseeded and mulched.</p>
RIPRAP FAILURES	<p>Very little riprap has been provided anywhere on the dam. Riprap and smeared concrete, both in good condition, have been provided around the stilling basin for protection against erosion.</p>	
EMBANKMENT MATERIALS	<p>The embankment appears to be largely constructed of gray clay with sand inclusions. The same clay is on the right abutment and shore areas. The outer embankment consists of gravelly fill. Vegetation has difficulty rooting in this material.</p>	

# EMBANKMENT

Name of Dam : SALISBURY LAKE DAM

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	<p>A 2 ft. deep gully has formed along the lower half of the junction of the downstream embankment with the left abutment. A less significant gully has also formed in the narrow area between the paved principal spillway discharge channel and the downstream embankment. This area is sparsely vegetated and erosion is affecting the toe of the dam locally.</p>	<p>The junction of the left abutment and the downstream embankment should be backfilled, compacted, and riprapped. The area between the paved principal spillway discharge channel and the downstream embankment should be filled, compacted, reseeded, and mulched to stop the erosion.</p>
ANY NOTICEABLE SEEPAGE	<p>Very slight seepage was observed directly below the outlets of the two 6 in. toe drains. Two adjacent seeps, with a combined flow of approximately 3 to 5 g.p.m. discharge into the spillway discharge channel approximately 50 ft. upstream of the stilling basin.</p>	<p>The two adjacent seeps may not be seeps through the embankment, but may instead be water that has made its way under the concrete lining of the spillway. The embankment should be periodically inspected for detrimental seepage.</p>
STAFF GAGE AND RECORDER	No staff gage was present.	<p>A staff gage should be installed to monitor reservoir levels above normal pool.</p>
DRAINS	<p>A headwall was observed on the downstream embankment containing two 6 in. outlets. No drainage was occurring directly from the outlets. Animal guards were installed over the outlets.</p>	<p>The outlets are located unusually high on the embankment. The toe drain might have been improperly constructed.</p>

# OUTLET WORKS

Name of Dam: SALISBURY LAKE DAM

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None observed	
INTAKE STRUCTURE	The intake structure is a 4 ft. by 4 ft. concrete drop inlet and tower which is drained through the embankment by a 24 in. corrugated metal pipe. Some trash has collected at the bottom of the drop inlet.	A trash rack should be installed to prevent plugging of the inlet.
OUTLET STRUCTURE	The outlet consists of a 24 in. corrugated metal pipe embedded in a concrete headwall and is in good condition.	
OUTLET CHANNEL	The outlet channel is a concrete-paved, trapezoidal channel 35 ft. long, with a bottom width of 2 ft., 30° side slopes and 2.2 ft. deep. It empties into the larger emergency spillway discharge channel approximately 250 ft. upstream of the stilling basin.	
EMERGENCY GATE	The emergency gate is a 24 in., hand-operated slide gate, which is in poor condition.	The gate should be tested periodically, repaired if needed, and maintained in an operable condition.

# UNGATED SPILLWAY

Name of Dam: SALISBURY LAKE DAM

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	<p>A concrete-paved, trapezoidal spillway is located at the right end of the dam. The control section is 40 ft. wide by 14 ft. long. Side slopes are 1.75H:1V and extend to the top of dam, a height of about 5.5 ft. The concrete in this area is in good condition.</p>	
APPROACH CHANNEL	<p>The approach channel is in generally good condition. Some sediment has been deposited in the approach channel as the result of minor erosion on the right abutment of the dam. Minor floating debris is present in the approach channel, but presents no obstructions.</p>	
DISCHARGE CHANNEL	<p>The discharge channel is a concrete-paved, trapezoidal channel from the control section to the stilling basin near the toe of the dam. Approximately 180 ft. downstream from the control section, the principal spillway discharge channel empties into this channel. From the control section to the outlet of the principal spillway discharge channel, the bottom width and depth decrease to 8 ft. and 2.2 ft., respectively. The channel remains uniform to the stilling basin, approximately 250 ft. downstream.</p> <p>Some erosion and minor slumping is apparent on the natural slopes to the right of the spillway discharge channel. Several small eroded areas have recently been backfilled and riprapped and are now in good condition. Rough concrete has been placed along the lower end of the channel.</p>	<p>The eroded areas to the right of the channel should be filled, compacted, and reseeded. Areas adjacent to the channel should be periodically checked for erosion and, if necessary, stabilized with vegetation or riprap.</p>



UNGATED SPILLWAY

Name of Dam: SALISBURY LAKE DAM

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
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BRIDGE AND PIERS	None present	
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# INSTRUMENTATION

Name of Dam: SALISBURY LAKE DAM

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None present	All elevations are referenced to the emergency spillway crest elevation. The design elevation of this point is 305.5 ft. T.B.M.
OBSERVATION WELLS	None present	
WEIRS	None present	
PIEZOMETERS	None present	
OTHER		

# RESERVOIR

Name of Dam: SALISBURY LAKE DAM

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
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## SLOPES

The slopes around the reservoir are gentle and largely wooded. Homes border the reservoir. A beach area has been developed on the shore of the lake near the left abutment of the dam. A diving platform is anchored in the reservoir a short distance offshore. Near the right abutment, a picnic pavilion is located on the hillside above the dam.

## SEDIMENTATION

No significant signs of sedimentation or erosion were observed.

# DOWNSTREAM CHANNEL

Name of Dam: SALISBURY LAKE DAM

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	<p>A parking area is located on the hillside above the downstream side of the left abutment. A dirt road runs along the downstream toe of the embankment from the parking area to the stilling basin. A 14 in. storm sewer carries surface runoff from the parking area to the creek downstream of the stilling basin.</p> <p>Downstream of the stilling basin, the channel is heavily wooded. A large railroad embankment is located approximately 0.5 miles downstream of the dam. The stream is conveyed beneath the embankment by a large rectangular culvert.</p>	
SLOPES	<p>The stream channel below the dam has a slope of approximately 0.9%.</p>	
APPROXIMATE NO. OF HOMES AND POPULATION	<p>Approximately 20 homes are located low in the valley and downstream of the dam and railroad embankment.</p>	

APPENDIX IV  
PERTINENT CORRESPONDENCE



# Lake Salisbury Association

P.O. BOX 232, MIDLOTHIAN, VIRGINIA 23113

February 13, 1981

Mr. R. V. Davis, Executive Secretary  
State Water Control Board - Commonwealth of Virginia  
2111 Hamilton Street - P. O. Box 11143  
Richmond, Virginia 23230

Dear Mr. Davis,

I have had the opportunity to review the Preliminary Phase I Inspection Report for the Lake Salisbury Dam.

I immediately contacted Mr. Ken Timmons of the firm of J. K. Timmons and Associates, Civil Engineers. They are in the process of reviewing your report. We anticipate meeting again shortly to devise a mutually agreeable plan of action to remedy the alleged deficiencies listed in your report.

I will keep you advised of our progress.

Sincerely,

Reed Schweickert, President

cc: Mr. Ken Timmons, J. K. Timmons & Associates, Inc.  
711 North Courthouse Road

APPENDIX V  
GENERAL REFERENCES

## GENERAL REFERENCES

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NAME OF DAM: SALISBURY LAKE DAM



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17. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, "Hydrometeorological Report No. 51, Probable Maximum Precipitation Estimates, United States East of the 105th Meridian," Washington, D.C., June 1978.

NAME OF DAM: SALISBURY LAKE DAM

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